

Extensive studies of pollen viability, germination, and pollen-tube growth are summarized. The fate of embryos and endosperm in incompatible crosses, the growth of ovular tumors, and the physiological aspects of seed abortion are among the topics discussed.

In later years special attention has been paid to the vital link between generations, the seed. Problems of incompatibility, sterility, and abortion required attention and led to the development of a method for the culture of embryos. Many observations have led to a partial understanding of the numerous complex processes going on simultaneously in the growing seed. Here are dozens of unsolved problems for which the *Datura* investigators suggest promising lines of attack.

In the chapter on "Segmental Interchanges and the Species Problem," Miss Satina assembles considerable material on prime types, racial differences, interspecific hybrids, and the characteristics of hybrids from incompatible crosses. The problems of chromosome analysis, ring formation, and of chromosome-end arrangements are examined. The abundant occurrence of segmental interchange present in the various races of *Datura* is unusual, but the condition is known in some other plants. In spite of intensive study, the exact relationship of the phenomenon to speciation remains obscure. We may agree with Blakeslee when he says that, "The frequency of interchange of chromosomal fragments in *D. stramonium* and the relation of this phenomenon to the formation of new pure-breeding types has led to the hypothesis that segmental interchange has accompanied the changes responsible for the formation of species in the genus *Datura*. Nevertheless, in spite of very intensive study the relationship of the phenomenon to speciation remains obscure." We may hope that some day *Datura* will be a valuable instrument in helping us work out the relationship between genes and chromosomes which will further our understanding of the evolutionary picture.

The scientific world owes its gratitude to Smith College and the National Science Foundation for contributing assistance, facilities, and finances towards the completion of this work. Congratulations are due the Ronald Press for its part in this fine enterprise, for the volume is pleasing in all aspects. High praise is due the committee of the Genetics Society of America which catalyzed the reaction which resulted in the publication of this labor of love.

Attention should be called to page three of the volume, which carries an invitation to investigators interested in securing material of the Jimson weed in order to add further chapters to our knowledge of the members of this fascinating genus.—ALTON H. GUSTAFSON, Department of Biology, Bowdoin College, Brunswick, Maine.

Vascular Plants of the Pacific Northwest. By C. LEO HITCHCOCK, ARTHUR CRONQUIST, MARION OWNBAY, and J. W. THOMPSON. Illustrated. University of Washington Press. Part 5, pp. 1-343. 1955. \$7.50. Part 4, pp. 1-510. 1959. \$12.00.

Present or future students of the Pacific Northwest flora will find their time well spent in carefully looking through the two volumes now available of the projected five-volume "Vascular Plants of the Pacific Northwest." It is a credit to the authors that they have drawn on their wide experience in the western flora to point out and discuss specific problems such as unusual variation patterns, possible hybridization, disjunct or vicarious distributions, and a host of other phenomena which suggest a number of areas requiring the attention of biosystematists, plant geographers, genealogists, and cytologists. This is merely a bonus added to a sound taxonomic treatment of the 4000 vascular plants (upon completion) either native or introduced in "all of Washington, the northern half of Oregon, Idaho north of the Snake River Plains, the mountainous portion of Montana, and an indefinite southern fringe of British Columbia." The area circumscribed is a natural floristic unit and excludes most of the interesting but large Great Basin flora occurring in the southern portions of Idaho and Oregon as well as the sizable cluster of endemic or California-centered species characteristic of southwestern Oregon.

The two volumes published to date are Parts 4 and 5 of the series: Part 5 is a

monograph of the Compositae by Arthur Cronquist and Part 4 includes treatments by Cronquist (Polemoniaceae through Campanulaceae, except *Castilleja*), C. Leo Hitchcock (Ericaceae through Cuscutaceae), and Marion Ownbey (*Castilleja*). Although J. W. Thompson has not yet contributed texts, his valuable and extensive collections in the Northwest serve as a substantial basis for the present knowledge of the northwestern flora, hence his inclusion as a co-author is fully justified even in the absence of such textual material. The families are arranged in the Englerian sequence; the genera and species within a genus are arranged alphabetically. This practice eliminates the need for an index, although one to the synonyms of the larger genera and to common names is included. The chief difficulty with this alphabetical arrangement is that closely related species and genera are placed together only rarely, thus rendering a character-by-character comparison of two taxa (as is often done during the course of identification) rather more difficult. Taxonomic concepts are admittedly conservative, which results in the volumes being attractive for purposes of identifying species of such name-ridden genera as *Aster*, *Castilleja*, *Erigeron*, and *Senecio*.

In Part 5, Cronquist outlines his philosophy of taxonomy, which we assume to be the philosophy of the other authors as well in the absence of any statements to the contrary. His discussion is worth reading since he presents particularly well his views as an "orthodox" taxonomist on some of the attitudes held in the past by experimentally oriented workers. The term *variety* is preferred to *subspecies* when only one infraspecific level is recognized. In a few instances where it has been necessary to utilize two infraspecific levels, *variety* is subordinate to *subspecies*; *forma* is not used. It is a reflection of the authors' conservatism that infraspecific categories are widely used for entities which other workers prefer to recognize as species. In attempting to conform to their system, numerous changes in rank of many taxa have been made, involving transfers from subspecies to variety. Fortunately, these changes have been rendered somewhat inconspicuous by their placement among the synonymy of the species. The synonymy of each species is laudably complete and gives the full bibliographical citation, the collector, locality, and date of collection for the type of each synonym.

The volumes issued to date have served as vehicles for the publication of three highly localized species: *Chaenactis thompsonii*, *Hackelia davisii*, and *Luina serpentina*—appropriately endemic to Washington, Idaho, and Oregon respectively. In addition to these new species, numerous varieties are described for species of many genera. This emphasizes the fact that the Pacific Northwest is far from completely known botanically. In addition to these novelties, numerous changes of rank and transfers from one taxon to another are made. Hence this work can hardly be called an automatic compilation; rather it is an original, critical treatment of all the species it covers. The geographical ranges of the taxa are specifically outlined and, where known, ecological data regarding the habitat are included as well.

Although the authors have made extensive use of existing taxonomic monographs (many of which are cited in the text), they have obviously felt no obligation to follow these works in their own treatments. Undoubtedly they will receive criticism for their handling of many groups, but the citation of monographs and the lists of synonyms will make it easy for those who do disagree on some count to find other interpretations of the group in question. The Menyanthaceae and Gentianaceae are considered separate families; on the other hand, the Lobeliaceae are included in the Campanulaceae. Genera of the Vacciniaceae, Pyrolaceae, and Monotropaceae are found within the Ericaceae. *Ipomopsis* is relegated to *Gilia* and *Cacaliopsis nardosmia* will be found as a *Luina*.

The work serves as an interesting chronicle of the fate of many weedy introductions into the area. For instance, we learn that *Anthemis mixta* L. and *A. altissima* L. have both been collected only on the famous ballast heaps at Portland and presumably have failed to become members of the naturalized flora of the Pacific Northwest. This is quite different behavior from that of their cogeners *Anthemis*

cotula L. and *A. arvensis* L., which have been extremely successful in becoming established in the region as weeds. *Conyza floribunda* H.B.K. and *Tournefortia sibirica* L. have apparently only persisted at their point of introduction and are not expanding in range. But by far the largest number of weeds have become widely distributed in the region and most, if not all of these are discussed in the text. These different patterns of behavior subsequent to introduction suggest a fertile field for genealogical studies.

Notes on the cultivation and ornamental value of many of the native species included in Part 4 have been supplied by two accomplished Seattle horticulturalists: Carl English and Brian O. Mulligan. These men and a number of other northwestern gardeners have demonstrated the high desirability of native plants in the garden when they are grown properly. The ornamental value of the northwestern flora is not as widely appreciated in this country as it deserves to be; it is probably easier to purchase seeds of Northwest Pacific Coast indigens from British and European nurserymen than from American ones. It is true that attractive species such as *Gaultheria shallon*, *Arctostaphylos uva-ursi*, and *Arbutus menziesii* are rather widely grown, yet too few gardeners are aware of the potentialities of equally attractive species such as *Menziesia ferruginea*, *Vaccinium ovatum* and *V. parvifolium*, and *Polemonium carneum*. The majority of these species can be propagated or obtained in a manner which does not involve denudation of the countryside. Understandably, horticultural notes have not been included for the Compositae, whose contribution from the temperate zone of a large and diverse assemblage of weeds largely outweighs its contribution of a depauperate ornamental flora.

Chromosome numbers are included for most of the taxa in which they are known, although the literature sources for these numbers are not given. In the instances of circumboreal or polytypic species, or of polyploid complexes, it would be valuable to know the geographical source of the plants on which the counts are based.

Despite the necessity of using the same type throughout the entire work, the format of the book is enlivened by consistent use of indentations, capital letters, and underlinings for various kinds of information repeatedly appearing in each species description. Part 5 appears to be free of typographical errors; there are, however, several errors in Part 4 but none has been found which seriously impairs the meaning or usefulness of any section of the book. Each species discussed is illustrated; the Compositae were drawn by Dr. John Rumely and the taxa in Part 4 were done by Jeanne R. Janish, who is well known in the west for her work on Abrams' "Illustrated Flora of the Pacific States." Both artists have provided a felicitous combination of accurate scientific illustration with esthetically pleasing artistry. Dr. Rumely's drawings lack some of the three-dimensional qualities of Mrs. Janish's and are more obviously based on herbarium specimens; this may, however, prove to be something of a virtue in view of the high likelihood that most botanists would prefer to bring their specimens back from the field in press, rather than carry these bulky volumes with them in the field.

The keys are quite usable and generally include a number of characters which can be utilized in identifying an unknown species. Since the series is not yet complete, no glossary of terms or key to the families is provided. However, the publishers promise a family key in Part 1, and the authors promise that "a more nearly natural arrangement of the families and orders of dicotyledons will be presented at the beginning of Part 2." The high caliber of the work that has so far appeared makes us eagerly await the completion of this valuable contribution to the knowledge of the flora of the Pacific Northwest.—ROBERT ORNDUFF, Department of Botany, University of California, Berkeley.